PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 3 : A61N 5/06; A61H 39/00 — A1

(11) International Publication Number: WO 84/ 04463

(43) International Publication Date: 22 November 1984 (22.11.84)

(21) International Application Number: PCT/HU84/00031

(22) International Filing Date: 10 May 1984 (10.05.84)

(31) Priority Application Number: 1620/83

(32) Priority Date: 11 May 1983 (11.05.83)

(33) Priority Country: HU

(71) Applicant *(for all designated States except US):* MTA KÖZPONTI FIZIKAI KUTATÓ INTÉZETE [HU/HU]; Konkoly Thege ut 29-33., H-1525 Budapest XII. (HU).

(72) Inventors; and
(75) Inventors/Applicants *(for US only) :* APAI, Pál [HU/HU]; Leányka u. 22., H-1221 Budapest XXII. (HU). KISS, Árpád [HU/HU]; Kruspér u. 6-8., H-1111 Budapest XI. (HU). KROO, Norbert [HU/HU]; Apáczai Csere J. u. 17., H-1052 Budapest V. (HU). ROZSA, Károly [HU/HU]; Szakasits A. ut 44/b., H-1115 Budapest XI. (HU). RUBIN, György [HU/HU]; Fülemile ut 12-18., H-1121 Budapest XII. (HU).

(74) Agent: PATENTBUREAU DANUBIA; P.O. Box 198., H-1368 Budapest (HU).

(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), FR (European patent), GB (European patent), JP, LU (European patent), NL (European patent), SE (European patent), US.

Published
With international search report.

(54) Title: METHOD AND DEVICE FOR STIMULATING BIOLOGICAL PROCESSES

(57) Abstract

The method and device is designed for biostimulation (for example wound-healing, acupuncture, rheumatologic and cosmetic purposes). The device includes a light source connected to a power supply, the light source consists of one or more light emitting diodes. The said light emitting diodes which have advantageously polarized light or are equipped with a polarizer are connected to a power supply which includes a modulator.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	**KR**	Republic of Corea
AU	Australia	**LI**	Liechtenstein
BE	Belgium	**LK**	Sri Lanka
BG	Bulgaria	**LU**	Luxembourg
BR	Brazil	**MC**	Monaco
CF	Central African Republic	**MG**	Madagascar
CG	Congo	**MR**	Mauritania
CH	Switzerland	**MW**	Malawi
CM	Cameroon	**NL**	Netherlands
DE	Germany, Federal Republic of	**NO**	Norway
DK	Denmark	**RO**	Romania
FI	Finland	**SD**	Sudan
FR	France	**SE**	Sweden
GA	Gabon	**SN**	Senegal
GB	United Kingdom	**SU**	Soviet Union
HU	Hungary	**TD**	Chad
JP	Japan	**TG**	Togo

METHOD AND DEVICE FOR STIMULATING BIOLOGICAL PROCESSES

The subject matter of the invention is a method and device for stimulating biological processes, for example for wound-healing, acupuncture, rheumatology and cosmetic purposes.

It is known that for treating wounds slow in healing lasers may be used in clinical practice. Such lasers are generally He-Ne or Ar-ion lasers. During treatment the laser light beam is directed to the wound by means of appropriate optical devices, and by moving the beam, the whole surface of the wound is swept. Several contradictory theories have been put forward to explain the biologically stimulating effect of the laser light but at present no generally accepted scientific interpretation is available. The publications mostly provide only the results of the treatments and only a few attempts were made to decide to which specific feature of the laser is the biostimulative effect due. On the basis of the results published, a general work is for example, "Der Laser" by Endre MESTER (Springer Verlag, 1981), laser beam treatment has greater potential applications in clinical practice than have so far been taken advantage of.

It should however be said that certain factors obstruct the general employment of laser treatment in clinical practice. One of these factors is that continuously working lasers having appropriate beam diameter and efficiency are expensive, the other factor is that, these lasers have intricate structural set up and their operating voltage is high therefore their handling requires spe-

cific knowledge. Another drawback is that as there are technical limits of increase the beam diameter in cases if you wish to ensure the generally used power density of 2-10 mW/cm^3 for any single treatment so the sweeping of wounds of bigger surface requires due foresight.

When treating wounds slow in healing successful experiments were performed by means of projection machines equipped with a polarizer and an infra-red cutting filter in addition to the usual optical system (Bazsó, Varju, Szegő, Rózsa, Apai: "Employment of incoherent polarized wide-band light beam for facilitating wound healing" KFKI 1981-73., Budapest). Although such projection machines are not as expensive as lasers, they are large, they generally require cooling, and they work with low efficiency.

The aim of this invention was to produce a device which stimulated biological processes at least to the same extent as the devices known so far but which is simple in structure, is inexpensive, small-sized, reliable, has a long life as well as being efficient and thus can widely be used in addition to medical applications for cosmetic purposes and for treatment at home.

The invention overcome the drawbacks of currently available devices by utilizing one or more light emitting diodes (LEDs) as light source. LEDs give advantageously polarized light or may be equipped with a polarizer. These LEDs are equipped with a power supply including a modulator.

Larger surfaces can advantageously be irradiated by utilizing additional LEDs, for example by arranging them in matrix which enable uniform and

rapid treatment of the whole surface without sweeping. In contrast to the practice until now that filtered the infra-red rays, LEDs working in the infra-red range can advantageously be applied as well, especially for the treatment of the tissues which are deep below the skin - as a result of the increased penetration depth. The equipment embodies a power supply with a modulator by means of which the LEDs can emit light pulse series enabling high peak power of the pulses at low average power. In the case of lasers used for similar purposes such modulation can be realized only in a narrower power range and with complicated and expensive equipment.

It may be advantageous to use LEDs with polarized light or to use a polarizer in front of the non-polarized LEDs. For the latter case a polarizer prism, polarizer plate or a glass plate placed at appropriate angles (Brewster angle) can be used as the polarizer.

The said invention is thus simple and safe, low in price, has great reliability and long life thereby enabling the general use of the equipment and its employment for treatment at home or for cosmetic purposes.

C L A I M S

1. Method for stimulating biological processes mainly for wound-healing, acupuncture, rheumatologic and cosmetic purposes c h a r a c t e r i z e d i n that the light of light emitting diodes is used for radiation treatments.

2. Device for stimulating biological processes mainly for wound-healing, acupuncture, rheumatologic and cosmetic purposes, containing a light source connected to a power supply c h a r a c t e r i z e d b y the light source consisting of one or more light emitting diodes.

3. The device described in claim 1, c h a r a c t e r i z e d b y the embodiment of LED (LEDs) with polarized light or by it (them) being equipped with a polarizer.

4. The device described in claims 1 and 2, c h a r a c t e r i z e d b y the LED (LEDs) being connected to a power supply.

5. The device described in claims 2-4, c h a r a c t e r i z e d i n that the LEDs are arranged in form of matrix.

INTERNATIONAL SEARCH REPORT

International Application No PCT/HU 84/00031

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl.[3]: A 61 N 5/06, A 61 H 39/00

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
IPC[3]	A 61 N 5/00, A 61 H 39/00, G 09 F 9/00

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [6]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
X Y	US, A, 4 112 923 (TOMECEK) 12 September 1978 (12.09.78), see abstract, column 5, lines 14-16, fig.7.	(1,2,4) (5)
Y	US, A, 4 241 277 (HINTZE) 23 Dezember 1980 (23.12.80), see abstract, fig. 1.	(5)
X Y	FR, A1, 2 371 935 (NOGIER) 23 June 1978 (23.06.78), see page 2, lines 22-25, page 3, line 40 - page 4, line 3, fig. 3.	(1,2,4) (3)
Y	DE, A1, 3 220 218 (FENYÖ) 17 March 1983 (17.03.83), see abstract, claim 1, page 7, line 30 - page 8, line 17.	(3)
X	FR, A2, 2 399 256 (SKOVAJSA) 2 March 1979 (02.03.79), see page 1, lines 1-3, page 2, line 30 - page 3, line 6, fig. 2,3.	(1,2,4,5)

* Special categories of cited documents: [15]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
13 June 1984 (13.06.84)	20 June 1984 (20.06.84)
International Searching Authority [1]	**Signature of Authorized Officer [20]**
AUSTRIAN PATENT OFFICE	

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category*	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No [18]
X	EP, A2, 0 058 105 (JAVELLE) 18 August 1982 (18.08.82), see page 6, line 36 - page 7, line 25.	(1,2,4)
X	DE, A1, 3 237 398 (CESKOSLOVENSKE AKADEMIE) 28 April 1983 (28.04.83), see abstract, claim 1, page 6, line 23 - page 7, line 10, fig. 2,3.	(1,2,4)

Anhang zum internationalen Recherchenbericht über die internationale Patentanmeldung Nr.

Annex to the International Search Report on International Patent Application No. PCT/HU 84/00031

Annexe au rapport de recherche internationale relatif à la demande de brevet international n°.

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten internationalen Recherchenbericht angeführten Patentdokumente angegeben. Diese Angaben dienen nur zur Unterrichtung und erfolgen ohne Gewähr.

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned International search report. The Austrian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

La présente annexe indique les membres de la famille de brevets relatifs aux documents de brevets cités dans le rapport de recherche internationale visé ci-dessus. Les renseignements fournis sont donnés à titre indicatif et n'engagent pas la responsabilité de l'Office autrichien des brevets.

Im Recherchenbericht angeführtes Patentdokument Patent document cited in search report Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
US-A -4 112 923	12/09/1978	None	
US-A -4 241 277	23/12/1980	WO-A1- 80/01 860	04/09/1980
		EP-A1- 0 024 423	11/03/1981
		JP 56-500 273	05/03/1981
FR-A1-2 371 935	23/06/1978	FR-B1- 2 371 935	11/05/1979
DE-A1-3 220 218	17/03/1983	IL-AC- 66 643	23/02/1983
		BE-A1- 894 290	02/03/1983
		DK-A - 3 879/82	03/03/1983
		FI-A - 82-2 940	03/03/1983
		NO-A - 82-2 871	03/03/1983
		SE-A - 82-02 568	03/03/1983
		FR-A1- 2 511 877	04/03/1983
		AU-A1- 87 776/82	10/03/1983
		GB-A1- 2 105 195	23/03/1983
		NL-A - 82-03 377	05/04/1983
		JP-A2- 58-73 375	02/05/1983
		ES-A1- 515 325	01/06/1983
		-A5-	30/06/1983
		LU-A - 84 349	07/06/1983
		BR-A - 82-05 145	09/08/1983
		DE-U1- 82-24 580	25/08/1983
		ZA-A - 82-6 320	28/09/1983
		DD-A5- 204 850	14/12/1983
FR-A2-2 399 256	02/03/1979	SE-A - 78-05 479	17/11/1978
		NL-A - 78-05 148	20/11/1978
		DE-A1- 2 820 908	23/11/1978
		JP-A2-53-145 386	18/12/1978

Anhang zum internationalen Recherchenbericht über die internationale Patentanmeldung Nr.

Annex to the International Search Report on International Patent Application No. PCT/HU 84/00031

Annexe au rapport de recherche internationale relatif à la demande de brevet international n°.

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten internationalen Recherchenbericht angeführten Patentdokumente angegeben. Diese Angaben dienen nur zur Unterrichtung und erfolgen ohne Gewähr.

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned International search report. The Austrian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

La présente annexe indique les membres de la famille de brevets relatifs aux documents de brevets cités dans le rapport de recherche internationale visé ci-dessus. Les renseignements fournis sont donnés à titre indicatif et n'engagent pas la responsabilité de l'Office autrichien des brevets.

Im Recherchenbericht angeführtes Patentdokument Patent document cited in search report Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
FR-A2-2 399 256	02/03/1979	ES-A1- 469 862	16/09/1979
		US-A -4 232 678	11/11/1980
		GB-A1-1 600 217	14/10/1981
		CA-A1-1 133 348	12/10/1982
		HU-B - 180 083	28/01/1983
EP-A2-0 058 105	18/08/1982	EP-A3-0 058 105	08/09/1982
		BE-A1- 891 860	17/05/1982
		FR-A1-2 498 927	06/08/1982
DE-A1-3 237 398	28/04/1983	FR-A1-2 514 257	15/04/1983
		JP-A2-58-130 042	03/08/1983